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RAILWAY COMPETITION: A PROBLEM IN STATISTICS.

By H. T. Newcomb,
U. S. Department of Agriculture.

The interstate commerce law, which has now been in force nearly nine years, declares illegal certain practices believed to be evil in their tendencies, and prescribes a series of remedies. The first three sections forbid all excessive or unjustly discriminating charges for railway service, while the fourth adds a rule of evidence, imposing upon the carrier making a higher charge for a shorter intermediate service than for a longer one in the same direction the burden of sustaining the relative equity of the higher charge by showing that substantially dissimilar circumstances or conditions govern the shipments accepted at the different rates. Each of the three remedies which the law sought to apply had been previously advocated as in itself a sufficient measure of relief. These three remedies are: —

(1) The perpetuation of competition among railways.

(2) A summary process for hearing and adjudicating complaints arising under the law, and for enforcing proper redress of discovered injustice.

(3) Publicity for the details of railway management and operation.

No intelligent student of the problems of railway transportation now denies that the attempt to perpetuate competition by means of the anti-pooling provision embraced in the fifth section was a grievous mistake, and has seriously hindered the remedial operation of the remaining portions of the law. Its effect is to force upon the railways an unnatural and uneconomic competition, destructive alike to earning capacity, sound business methods, and official probity, which does not confer upon railway patrons even partially compensatory benefits. It has proved to be prolific in the production of unjust discriminations and extravagant expenditures, and the occasional evasions have been accomplished only by the creation of elaborate, cumbrous, and expensive machinery, which unsatisfactorily executes, by complex methods, the naturally simple task of equitably dividing competitive traffic. That this provision continues to encumber a statute with the fundamental purpose of which it is in irreconcilable conflict is due to the fact that a bill, which passed the House of Representatives by an overwhelming majority during the last session of the Fifty-third Congress, was defeated in the Senate, because the rules of that body, coupled with the opposition of a numerically insignificant minority, and the near approach of the end of a short session, made it impossible for its friends to secure a vote upon its passage.

Judicial interpretation has practically emasculated the second remedy by claiming for the United States courts, to which the Interstate Commerce Commission is forced to resort in order to secure the execution of its decrees, the right to examine every case from the beginning, and denying any finality whatever to the proceedings before the Commission; and, while there is occasional compliance with the orders of the Commission, it is only in those cases in which the reasoning upon which they are based is so clear that the defendant railways are unwilling to assume the responsibility for refusal to obey mandates that are certain, eventually, to receive the endorsement of public opinion.

The only remedy remaining, and the only one which has not utterly failed to perform the service for which it was intended, is that which operates through turning enlightened public sentiment into a remedial force. The preliminary condition essential to the evocation of this force is publicity, and the principal means for securing this, provided in the act, are: —

(1) Requiring carriers to print, publish, and file with the Interstate Commerce Commission all schedules of charges.

(2) Requiring carriers to file copies of all agreements with other common carriers relating to traffic subject to the law.

(3) Investigations and reports by the Interstate Commerce Commission.

(4) Collection of railway statistics.

In this paper it is proposed to discuss a single phase of the latter of these measures, and to point out one of the many directions in which there is reason to believe that the statistical investigation of railway transportation might profitably be extended.

The importance of the intelligent application of the statistical method to the study of so vast an industry as that of moving persons and property by rail within the United States does not require argument at this time. The principal facts regarding an investment represented by eleven billion dollars of stocks and bonds, an industry giving direct employment to 800,000 men, and from which 4,000,000 persons derive their support, a machine that moves 170,000 tons of freight and 27,000 passengers one mile during every minute, must be stated, examined, compared, considered, and digested numerically or not at all. Prior to the passage of the act to regulate commerce, statistics of the railways of the United States were fragmentary and incomplete, or occasional and disconnected. Those officially compiled were exhausted when the transportation volume of the Tenth Census and the reports prepared by Dr. Nimmo for the Bureau of Statistics of the Treasury Department had been

consulted. The next and last resort of the investigator was to the unofficial reports compiled by private parties from whatever data railway officials found it convenient or deemed it expedient and profitable to furnish. Now, however, there are available seven volumes of official reports, each describing the business of railway transportation as conducted during a particular fiscal year, and the condition of the railway system at its close. They have been compiled upon a scientific and ably conceived plan, and the continuity of purpose by which they are characterized adds greatly to their value, while, unfortunately for the results of the other work, it differentiates them from many of the reports of federal statistical investigations. Together they furnish legislators and students with a more accurate and comprehensive description of the business of railway transportation in the United States than is available for any other country, or for any other industry at home or abroad.

During the period from July 1, 1887, to June 30, 1894, which is covered by these reports, the average rate of fare collected from each passenger declined from 2.349 cents to 1.986 cents per mile, or 15.45 per cent, and the average rate of freight per ton per mile from 1.001 cents to 0.860 cent, or 14.09 per cent. If this decline had not taken place, and the railways had been able to collect for moving the traffic carried during 1894 the rates of 1888, they would have earned $51,870,688 from passengers, and $113,272,498 from freight, or a total of $165,143,186 more than they actually received. The total amount paid in dividends during the later year was $95,515,226, or only 57.83 per cent of the amount saved to the public by reduced rates. The par value of railway stock receiving no dividends during 1888 was $2,374,200,906, or 61.44 per cent of the total. In 1894 the amount thus portionless showed both an absolute and relative increase, having reached $3,066,150,094, or 63.43 per cent of the total. During the later year no interest was paid upon $914,757,607 of funded debt as against $827,554,319

in 1888, and, though in this instance there was a slight relative decrease, the par value of capital receiving no return during 1894 amounted to 39.31 per cent of the aggregate. The public saving from reduced charges, if retained by the railways, would have paid dividends and interest averaging 4.15 per cent on this barren stock and unfruitful funded debt. The average return to all classes of railway capital was 3.32 per cent, but had rates upon the traffic carried been maintained at the level in force during the first year of the period the additional return to investors would have made the average 4.85 per cent.

From 1889 to 1894 the average revenue per train mile declined 1.60 per cent, while the average cost of running a train one mile could be reduced only 1.47 per cent, indicating a loss of net train earnings per mile run. Insignificant as this loss may appear, when stated in this manner, it represents a reduction in net revenue per train mile from 44.323 cents to 43.480 cents, which, applied to the train mileage of 1894, is found to be equivalent to a loss, to the railways, of $6,519,007 of net revenue. This indicates that it has been impossible to reduce operating expenses as fast as charges have been forced downward, and the truth of this is clearly apparent when it is learned that operating expenses which in 1889 were 66.81 per cent of the gross income from operation were 68.14 per cent of such income in 1894.

Passing from the fact of diminished returns to their consequences, it is found that during the year ending on June 30, 1894, there were 192 railway companies, operating more than 42,000 miles of line, and representing one-fourth of the total railway capitalization, in the hands of receivers. During the same year the income of the railways in a section including 52 per cent of the area of the United States did not earn enough above the actual cost of operation to pay their fixed charges.

These statistics of decreasing returns to investors, financial disaster, and widespread insolvency, clearly indicate that the

present railway charges are not too high, unless it is desirable to reduce all railway corporations to a uniform condition of hopeless bankruptcy. There is no public interest which demands that railway charges shall be so low as to be unremunerative. Too low charges invariably result in the speedy impairment of railway service through the physical deterioration of road-bed and equipment, and the reduction of the efficiency of the safeguards against accident usually provided, thus materially increasing the danger to life and property. The expenses due to handling traffic and moving trains are much less elastic than those incurred for keeping up the quality of track, rolling stock, and signalling apparatus; and when depleted revenues enforce upon railway managers the necessity of immediate retrenchment, the latter are most likely to suffer. Thus, when, during 1894, reduced traffic, low rates, and dwindling earnings required a reduction of 93,994, or nearly 11 per cent, in the number of men employed by the railways, nearly one-third of the entire number was taken from trackmen, their number being reduced 16.34 per cent, though they usually constitute only about one-fifth of the aggregate number of railway employees. The decrease in the number of employees per 100 miles of line, assigned to the maintenance of way and structures, was 18.54 per cent; in those assigned to maintenance of equipment, 16.50 per cent; while in those assigned to conducting transportation it was but 11.11 per cent. During the same year the expenses of operation were reduced 11.66 per cent, as compared with the previous year. Of the total decrease, $96,506,977, there was taken from the expenditures incident to the maintenance of way, structures, and equipment, 51.36 per cent, though these combined constituted during the previous year only 36.98 per cent of the total cost of operation.

Though expedients like the foregoing will invariably be resorted to, and interest and dividends paid by reducing the quality of the service rendered, they are necessarily temporary, and, eventually extravagant as physical deterioration,

increasing in geometrical progression, soon reach a point beyond which it may not be allowed to go, and final restoration is then found to cost much more than the total of the amounts which should have been regularly expended for maintenance. Unless revenues can be increased, the cost of such restoration must be taken from the return to investors, or met by new loans, and in either case bankruptcy is the usual and natural consequence.

The frequent failure of railway enterprises to prove remunerative, results in enhanced difficulty in the efforts to secure capital for the construction of new and often much needed lines, and in the exaction of conditions which afford at least a chance of extraordinary profits as an offset for what is regarded as the extra-hazardous nature of the investment. This opportunity for large returns very often takes the form of an excessive discount on the securities offered, or — what is much the same thing — a large stock bonus accompanying sales of bonds, these being among the most frequently deprecated methods of "stock-watering."

Practically, it may be declared that the public, considered as distinct from railway owners, must finally pay for all the transportation it receives, and that too low rates between particular points or during a particular period are not desirable, because, if for no other reason, they will inevitably be offset by too high rates between other points or during another period. Nor is this conclusion, as might appear, entirely satisfying to present railway owners, for long before the period of compensation arrives their interest may have been destroyed by insolvency, bankruptcy, and foreclosure.

It is apparent, then, that, considered from any reasonable standpoint, the present level of railway rates is too low rather than too high. This observation, however, relates only to the existing conditions of railway operation, which are chiefly characterized by the burden of unnatural and needless competition, which the public has imposed upon reluctant railway managers and owners. It is, no doubt,

possible to conceive different conditions under which economies could be devised that would prove sufficiently radical to render even lower rates than those now in force both practicable and profitable. Such a reduction in the cost of railway operation is the only direction that an important phase of railway reform can take. Railway charges cannot be generally raised without widespread disaster to industries that are dependent upon their continuance, at or below the present level, without substantially modifying the present basis of territorial exchanges of surplus products, nor without considerably increasing the cost to consumers of the commodities transported.

One of the most serious problems confronting legislators, students, and railway managers is to devise means whereby rates as low or lower than those now in force can be made reasonably and fairly remunerative. No one who has made an intelligent effort to deal with the problem has failed to perceive that, omitting the possibility of important new inventions, future retrenchment in the expenses of railway operation must be mainly accomplished by the elimination of the wasteful expenditures incident to competition for traffic. Though the existence of this source of loss is generally recognized, authentic statistics of the amounts wasted in the struggle for traffic between rival railways are exceedingly difficult to obtain, as the efficiency of most of the methods commonly resorted to in the effort to divert traffic from rival lines depends very largely upon the degree of secrecy attained in their execution, and for the further reason that many of these practices have been rendered illegal by statute, and are punishable by fine and imprisonment.

Among the most generally deplored results of competition is the practice of paying large commissions to influence the sending of traffic by particular lines. This is most frequently resorted to in connection with passenger traffic, and ticket agents are often allowed to retain large percentages from the sums charged for tickets between competitive

points as additional compensation for their sale. Each competing line endeavors to purchase the interest of agents by bidding a higher commission than that paid by others, and not infrequently a part of the allowance thus made is deducted from the rate charged a prospective passenger. In times of strenuous competition the same commissions are often allowed to ticket brokers or scalpers, and become an indirect means of rate cutting. The abolition of this practice, which has been a prolific cause of "rate wars," has often been attempted, but it has never been entirely abandoned, and, as long as competition continues, will probably be one of its ordinary weapons. According to a report made by the Interstate Commerce Commission, as the result of a special investigation of the subject, nine railways expended the sum of $1,097,130 for commissions during a single year.

The multitude of outside agencies, and travelling and other soliciting agents, involves another considerable expenditure that is solely due to competition. Their only object is to secure passengers and freight for their respective lines, and their cost is so great, even during seasons when rates are being fairly maintained, that it has often been found necessary to restrict their number by contract. It should be borne in mind that multiplicity of such agencies is, under present conditions, of no value to the travelling or shipping public. Being competitive, they do not spread themselves over the territory which they serve, so as to be sought most conveniently by railway patrons, but cluster around particular corners, where they can most advantageously watch and prey upon each other.

The economic waste arising from the competition of long, circuitous, and expensive routes for traffic that would naturally go by more direct and, consequently, cheaper routes is incalculable. Freight between New York and New Orleans furnishes a ready example, though not by any means an extreme instance of this form of waste. It is actively sought by numerous lines operating entirely by water, or by water

to the ports of Norfolk, Savannah, Charleston, etc., and thence by rail; and the rates obtainable are in consequence extremely low. Yet, in spite of this fact, nearly one hundred all-rail routes are known actively to seek to secure it. Of these the shortest and most direct is by way of Philadelphia, Baltimore, Washington, Lynchburg, Bristol, and Chattanooga, the entire distance being 1340 miles. In contrast with this, the longest route, involving a haul of 2051 miles, is by way of Buffalo, New Haven (Ind.), St. Louis, and Texarkana. Estimating the cost of running a train these distances, at the average cost per train mile given by the Statistician of the Interstate Commerce Commission in his latest annual report, the cost for the shorter distance is $1431, and for the longer $2190, an excess over the minimum of necessary expenditure for each trainload carried over the longer route of $759, or 53 per cent. This illustration is fairly typical of the entire system of competitive railway transportation. While it may be true that the shortest is not necessarily the cheapest route, it cannot be doubted that a considerable saving would accrue from forwarding all traffic over whatever routes should be found by careful experiment to be the cheapest, but this can never be fully accomplished until the ruinous competition of today is restricted.

Competitive train service, both passenger and freight, is also a fruitful source of extravagant expenditure which is not accompanied by any corresponding increase in the accommodations offered the travelling and shipping public. On every day, except Saturday, when two of the slower trains are omitted, twelve passenger trains leave Chicago for Omaha. If the four lines of railway that connect these cities had established this service in accordance with a public demand, it is reasonable to suppose that the hours of departure of these trains would be distributed over the day so as to suit the convenience of those passengers whose personal engagements or predilections would lead them to choose various hours for commencing so long a journey. The fact, however, is that

of the twelve trains, four leave between 5.45 and 6.00 P.M., all reaching their destination within twenty minutes of 8.00 A.M., and five leave within fifteen minutes of 10.15 P.M. Of the remaining trains, one leaves Chicago at 9.00 A.M., one at 11.30 A.M., and one at 4.30 P.M. The average number of through passengers carried by each of these trains is less than 40, and their total mileage during a year 2,141,685. The average cost of running a passenger train one mile over these roads cannot be less than $1.00, so that if the number of trains could be reduced one-half, which would afford all necessary facilities for through and local passengers, a saving of over one million dollars would be effected.

The one and one-quarter million freight cars owned by railway companies have not cost less than $300,000,000. Supposing each car to be capable of carrying 15 tons of freight during twelve hours of each day, at the rate of 30 miles per hour, it appears that the actual service performed by each car in 1894 was equal to carrying a full load less than 4500 miles during the entire year, or, in other words, to working at its full capacity but little more than 12 days out of 365. Locomotives and other rolling stock are handled with similar wasteful disregard of the simplest rules of economic operation, and this is largely because of the necessity of attracting traffic from rival lines by moving it in small quantities, allowing cars to be used for storage purposes, etc.

Advertising, so far as it is in excess of the quantity required to furnish the information demanded by the public, involves an expense that is wholly extravagant and unnecessary, and productive of no public benefit. The wasteful extent to which it is carried on, in order to attract competitive traffic, is apparent to any observer who will examine a few of the multitudinous devices resorted to in the effort to call attention to the claims of particular lines.

It has been observed that the data relating to these wastes of competition that have been quoted are fragmentary and unsatisfactory. In many cases it has been possible to present

them only after long and tedious computation, and in few cases do they cover the entire railway system of the United States. Statistics, pointing clearly to the fact that the business of conducting transportation by rail under existing conditions of operation and management and at present rates of fare and freight is not adequately remunerative, demonstrating also that this condition is socially detrimental, because, among other reasons, it is productive of danger to life and damage to property, presenting facts from which reasonable inductions concerning the most suitable remedy may be drawn, should go further and measure the extent of the annual loss attending the continuance of existing conditions, thus making clear the exigency of the situation, and the imperative demand for reform. These wastes constitute a large and characteristic portion of the loss that inevitably accompanies competitive distribution, and their thorough and scientific investigation would be a public benefit second to none that the statistician can confer. The attendant difficulties are great, but no more insurmountable than many that have been successfully overcome in connection with other problems, and any impartial investigation would undoubtedly receive the most hearty co-operation and generous assistance from those railway officials whose records and accounts must furnish the basis for the work. The scope and cost of such an investigation remove it from among those that can be undertaken by private statisticians, while its importance as a guide to legislation would fully justify the expenditure of public money necessary to secure complete and satisfactory results. It is not probable that any of the already overburdened statistical bureaus of the federal government could now add such an amount of labor to their regular work without some additional appropriation, and it is therefore important that Congress should especially authorize the investigation, and provide suitably for meeting its necessary cost. The familiarity of the officers and clerks of the Bureau of Statistics of the Interstate Commerce Commission

with railway statistics, and the fact that many of the necessary data are already contained in the annual reports rendered to the Commission by the railways, while other important inquiries could be added to the schedules without requiring their material modification, would make it possible for the work to be carried on in that office with less additional expense than elsewhere. The deservedly high reputation for ability and fairness, sustained by the present chief of that bureau, as well as that of the Commission itself, would give authoritative weight to the final report of such an investigation, and there is, consequently, abundant reason for delegating its prosecution to the bureau that has already contributed so satisfactorily to public information regarding interstate railway transportation.

MORTALITY IN TWENTY-THREE MASSACHUSETTS CITIES.

By Charles E. Burnap.

The following tables contain the death rates of 23 Massachusetts cities for 1885, corrected for age distribution, so as to be capable of comparison with the rest of the state. The necessity for making such a correction is occasioned by the fact that the cities usually contain an excess over the rest of the state of persons between the ages of 15 and 40, a period during which the mortality is comparatively low, consequently making the death rate of the cities somewhat lower than it would be if the age distribution were the same as that of the rest of the state. To eliminate this error a standard death rate of the city is first obtained. This indicates the death rate which would prevail if the death rate for each of twelve age periods were the same in the city as in the rest of the state. To find this the average death rate of the whole state for 20 years is obtained for each of twelve age periods, and the number of deaths which should have occurred of individuals between certain ages is calculated by comparing this death rate with the number of individuals of the given age living in the city. From the sum of the calculated number of deaths and the total population of the city the standard death rate is obtained.*

If the distribution of age is more favorable in the city, as it usually is, the standard death rate will be lower than the average death rate for the state at large. The proportion which exists between the average death rate of the state and the standard death rate of the city is the proportion by which the recorded death rate of the city must be raised to give the corrected death rate. Therefore, dividing the average death rate of the state by the standard death rate of the city will give the factor for correction, by which the recorded death rate must be multiplied in order to obtain the corrected death rate.

Table I gives the number of inhabitants and the calculated number of deaths for each of 12 age periods, from the sums of which is obtained the standard death rate. Table II contains the standard death rate, the factor for correction, the recorded and the corrected death rates for each of the 23 cities in the year 1885, while Table III shows the recorded and corrected death rate of five cities during a series of six census years.

* This is the well known method followed by the English Registration Reports, an illustration of which is given in Newsholme's *Vital Statistics*, page 93. It is here not quite so complete in details, since the sexes cannot be separated, but in essence remains the same.

TABLE I. CALCULATION OF STANDARD DEATH RATES IN MASSACHUSETTS.

Age Periods.	Mean Annual Death Rate of Mass. from 1865 to 1885.	Boston.		Worcester.		Lowell.		Cambridge.		Fall River.		Lynn.		Lawrence.		Springfield.	
		Population of Boston in 1885.	Calculated Number of Deaths.	Population of Worcester in 1885.	Calculated Number of Deaths.	Population of Lowell in 1885.	Calculated Number of Deaths.	Population of Cambridge in 1885.	Calculated Number of Deaths.	Population of Fall River in 1885.	Calculated Number of Deaths.	Population of Lynn in 1885.	Calculated Number of Deaths.	Population of Lawrence in 1885.	Calculated Number of Deaths.	Population of Springfield in 1885.	Calculated Number of Deaths.
Under 5....	68.12	35,449	2413.78	6,876	455.39	5,942	404.77	5,917	403.06	6,246	425.47	3,974	270.70	3,732	254.22	3,424	233.24
5 to 10.....	8.25	35,481	292.72	7,041	58.41	5,607	45.28	6,049	49.90	6,346	51.74	3,943	32.53	3,724	30.72	3,347	27.81
10 to 15.....	4.23	33,949	143.58	6,427	27.18	5,505	23.59	5,557	23.50	5,928	25.07	3,785	16.01	3,660	14.69	3,279	13.93
15 to 20.....	7.50	34,507	258.80	6,270	47.02	6,619	49.64	5,707	32.70	6,931	51.98	4,028	30.21	4,026	30.19	3,626	27.19
20 to 30. ...	10.42	85,552	891.45	13,548	141.16	14,346	149.48	12,399	129.19	11,305	117.80	10,044	104.66	8,202	85.46	7,626	79.49
30 to 40.....	10.90	64,942	707.87	10,957	119.45	9,906	107.97	9,216	100.45	7,615	83.00	7,710	84.04	5,851	63.77	5,764	62.82
40 to 50.....	12.29	46,353	569.68	7,970	97.95	7,164	88.04	6,646	81.68	6,018	73.96	5,851	70.81	4,505	55.36	4,640	57.13
50 to 60.....	18.06	28,881	521.59	4,944	44.79	4,788	43.38	4,224	38.27	3,806	62.73	3,526	63.68	2,909	52.55	3,102	56.02
60 to 70.....	33.37	16,701	558.42	2,903	96.87	2,725	89.93	2,528	84.36	1,846	61.60	1,877	62.63	1,549	50.79	1,841	61.43
70 to 80.....	71.94	6,682	480.70	1,134	81.78	1,127	81.06	1,120	80.57	670	48.19	895	73.38	545	39.20	721	51.77
80 and over	176.20	1,853	326.50	318	55.93	376	66.45	277	48.80	159	38.01	230	40.52	156	27.48	195	34.34
Total.....	.....	390,350	7165.09	68,388	1225.93	64,107	1149.56	59,640	1072.48	56,870	1039.55	45,863	849.17	38,859	713.43	37,575	705.17
Standard Death Rate		18.32		19.34		17.94		17.98		18.10		18.92		18.35		18.76	

TABLE I.—*Continued.* CALCULATION OF STANDARD DEATH RATES IN MASSACHUSETTS.

Age Periods.	Mean Annual Death Rate of Mass. from 1865 to 1885.	New Bedford.		Somerville.		Salem.		Holyoke.		Chelsea.		Taunton.		Haverhill.		Gloucester.	
		Population of New Bedford in 1885.	Calculated Number of Deaths.	Population of Somerville in 1885.	Calculated Number of Deaths.	Population of Salem in 1885.	Calculated Number of Deaths.	Population of Holyoke in 1885.	Calculated Number of Deaths.	Population of Chelsea in 1885.	Calculated Number of Deaths.	Population of Taunton in 1885.	Calculated Number of Deaths.	Population of Haverhill in 1885.	Calculated Number of Deaths.	Population of Gloucester in 1885.	Calculated Number of Deaths.
Under 5....	68.12	2,888	195.63	3,088	220.27	2,395	163.15	3,195	217.65	2,375	161.80	2,200	149.80	2,014	176.19	2,057	140.12
5 to 10.....	8.25	2,956	23.38	2,926	24.14	2,625	21.65	2,899	23.91	2,408	19.87	2,109	17.40	1,920	15.84	2,137	17.63
10 to 15.....	4.23	2,973	12.63	2,779	11.89	2,472	10.58	2,797	10.18	2,373	10.16	2,132	9.12	1,729	8.40	2,012	8.61
15 to 20.....	7.50	3,473	26.12	2,732	20.49	2,705	20.29	3,304	24.78	2,312	17.34	2,323	17.42	1,863	13.96	2,009	15.06
20 to 30.....	10.42	6,302	65.67	5,892	61.39	5,419	56.46	6,659	69.39	5,060	52.73	4,638	48.33	4,714	49.12	4,864	49.68
30 to 40.....	10.90	4,816	52.50	4,928	53.72	4,031	43.94	3,794	41.36	4,193	45.70	3,531	38.49	3,653	39.74	3,370	36.73
40 to 50.....	12.29	4,044	49.30	3,520	42.91	3,247	39.57	2,707	32.99	3,089	37.66	2,756	33.58	2,682	32.69	2,334	28.68
50 to 60....	18.06	2,921	52.72	2,223	40.13	2,450	44.22	1,541	27.81	2,006	36.21	1,956	35.29	1,717	30.99	1,615	28.57
60 to 70.....	33.37	1,808	60.33	1,257	41.95	1,622	54.13	697	23.25	1,284	43.85	1,251	41.78	967	32.27	802	26.76
70 to 80.....	71.94	912	65.61	481	34.60	843	60.64	237	17.01	474	34.10	590	42.45	400	28.78	375	26.97
80 and over.	176.20	279	49.15	144	25.37	280	49.34	65	11.45	126	22.20	187	32.95	136	23.96	128	22.55
Total.....	.....	33,391	655.04	29,970	576.86	28,089	563.97	27,895	509.78	25,700	481.62	23,673	466.61	21,795	451.94	21,703	401.36
Standard Death Rate..		19.31		19.24		20.07		18.27		18.73		19.71		20.73		18.49	

TABLE I.—*Concluded.* CALCULATION OF STANDARD DEATH RATES IN MASSACHUSETTS.

Age Periods.	Mean Annual Death Rate of Mass. from 1865 to 1885.	Brockton.		Newton.		Malden.		Fitchburg.		Waltham.		Newburyport.		Northampton.	
		Population of Brockton in 1885.	Calculated Number of Deaths.	Population of Newton in 1885.	Calculated Number of Deaths.	Population of Malden in 1885.	Calculated Number of Deaths.	Population of Fitchburg in 1885.	Calculated Number of Deaths.	Population of Waltham in 1885.	Calculated Number of Deaths.	Population of Newburyport in 1885.	Calculated Number of Deaths.	Population of Northampton in 1885.	Calculated Number of Deaths.
Under 5....	68.12	2,011	136.91	1,678	114.30	1,466	99.86	1,563	134.60	1,231	83.85	1,151	78.41	1,045	71.18
5 to 10.....	8.25	1,847	15.21	1,822	15.03	1,426	13.76	1,448	11.94	1,293	10.67	1,197	9.87	1,168	9.63
10 to 15.....	4.23	1,659	7.10	1,832	7.93	1,403	6.00	1,410	6.03	1,235	5.28	1,234	5.28	1,210	5.17
15 to 20.....	7.50	1,849	13.87	2,017	15.14	1,554	11.65	1,417	10.62	1,374	10.31	1,290	9.67	1,468	11.01
20 to 30.....	10.42	4,959	51.67	4,044	42.13	3,515	36.62	3,185	33.18	3,561	38.04	2,388	24.88	2,544	26.50
30 to 40.....	10.90	3,654	39.83	2,920	31.42	2,606	28.40	2,298	25.05	2,126	23.17	1,831	19.96	1,595	17.39
40 to 50.....	12.29	2,152	26.44	2,341	28.77	1,874	30.03	1,712	21.04	1,595	19.44	1,530	18.65	1,524	18.57
50 to 60.....	18.06	1,442	26.04	1,527	27.35	1,365	24.67	1,179	21.29	1,095	19.76	1,370	24.75	1,173	21.17
60 to 70....	33.37	777	33.32	1,000	33.37	730	24.36	720	24.02	686	22.89	994	33.17	730	24.36
70 to 80.....	71.94	333	23.95	450	32.37	372	26.76	347	24.92	314	22.59	548	39.42	307	22.09
80 and over	176.20	100	17.62	128	22.41	96	16.91	96	16.91	89	15.68	183	32.24	121	21.32
Total.....	.....	20,783	392.96	19,759	370.22	16,407	319.02	16,375	329.60	14,609	271.68	13,716	296.30	12,885	248.39
Standard Death Rate..		18.91		18.73		18.83		19.38		18.59		21.60		19.27	

TABLE II.* RECORDED AND CORRECTED DEATH RATES IN MASSACHUSETTS CITIES IN 1885.

	Standard Death Rate.	Factor for Correction for Age Distribution.	Recorded Death Rate.	Corrected Death Rate.		Standard Death Rate.	Factor for Correction for Age Distribution.	Recorded Death Rate.	Corrected Death Rate.
Boston	18.32	1.0551	24.61	25.96	Chelsea	18.73	1.032	20.07	20.71
Worcester	19.34	.999	19.40	19.38	Taunton	19.71	.980	19.85	19.45
Lowell	17.94	1.0774	20.73	22.33	Haverhill	20.73	.932	17.76	16.85
Cambridge	17.98	1.0750	20.99	21.56	Gloucester	18.49	1.045	19.49	20.36
Fall River	18.10	1.0699	22.51	24.08	Brockton	18.91	1.022	15.88	16.22
Lynn	18.92	1.0121	16.94	17.04	Newton	18.73	1.032	13.01	13.32
Lawrence	18.35	1.0534	19.92	20.98	Malden	18.83	1.026	14.99	15.28
Springfield	18.76	1.031	18.63	19.30	Fitchburg	19.38	.997	18.27	18.21
New Bedford	19.31	1.001	22.10	22.12	Waltham	18.59	1.044	15.20	15.87
Somerville	19.24	1.005	18.32	18.41	Newburyport	21.60	.894	17.94	16.05
Salem	20.07	.963	20.58	19.81	Northampton	19.25	1.004	15.12	15.18
Holyoke	18.27	1.058	19.29	20.45					

TABLE III.

RECORDED AND CORRECTED DEATH RATE OF FIVE MASSACHUSETTS CITIES DURING A SERIES OF SIX CENSUS YEARS.

	Standard Death Rate.	Factor for Correction for Age Distribution.	Death Rate 1865.		Death Rate 1870.		Death Rate 1875.		Death Rate 1880.		Death Rate 1885.		Death Rate 1890.	
			Recorded.	Corrected.	Recorded.	Corrected.	Recorded.	Corrected.	Recorded.	Corrected.	Recorded.	Corrected.	Recorded.	Corrected.
Boston	18.32	1.0551	23.6	24.9	24.3	25.6	26.2	27.6	23.7	25.0	24.6	26.0	22.5	23.7
Worcester	19.34	.999	24.9	24.9	21.8	21.8	20.9	20.9	20.9	20.9	19.4	19.4	17.6	17.5
Lowell	17.94	1.0774	18.6	20.0	23.2	25.0	20.5	22.1	22.0	23.7	20.7	22.3	25.2	27.1
Cambridge	17.98	1.0750	18.9	20.1	20.4	21.8	23.3	25.0	18.0	19.3	21.0	22.6	17.7	19.0
Fall River	18.10	1.0699	21.5	23.0	20.8	22.2	24.0	25.7	26.3	29.1	22.5	24.1	22.9	24.5

* For comparison with these figures it may be useful to add the general death rate for the state of Massachusetts: 1865, 20.64; 1870, 18.75; 1875, 21.17; 1880, 19.79; 1885, 19.61. Attention is also called to the calculations made by Dr. S. W. Abbott, Secretary of the Massachusetts State Board of Health, in the Report for 1895, p. ci, on *Comparative Mortality of Massachusetts, 1885, 1890.*— EDITOR'S NOTE.

NOTE ON METHODS OF ESTIMATING POPULATION.

In the issue of this journal for December, 1895, in the course of a review of "Some Recent Contributions to Vital Statistics," Mr. Calkins expresses himself somewhat severely in regard to my use of the arithmetic, instead of the geometric, method of estimating population between census years in the Registration Reports of Michigan. I am indebted to the reviewer for voicing definitely the common prejudice against what seems to me not only the most convenient and generally practicable, but also the most accurate and scientifically correct, method of estimating population for intercensal years in many of the states of this country. It was with a full knowledge of this prepossession in the minds of many statistical writers in favor of the geometric method, and after a careful consideration of the relative advantages of the two systems, that I decided to adopt that employed in the Michigan Registration Reports since 1891, namely, the common arithmetic method, or that of adding the average annual increase between censuses as the estimated increment from year to year.

The geometric method of estimating population, like any other method, is used for two purposes: (1) The interpolation of populations between two given census years, or true intercensal estimates, and (2) the prediction of populations subsequent to the last census, or what I may call postcensal estimates. Its application to conditions such as attend the development of the population of Michigan (and certain other states) at the present time is illogical, and therefore necessarily unscientific. The reasons for its exclusion in both cases are as follows: —

(1) The geometric method assumes as a fundamental postulate that annual increments of population are proportional to the initial populations upon which they are based; as a necessary corollary, that the annual increments of population for the latter years of an intercensal period are larger than those for the early years; and, as a further corollary, that increments of population for successive periods of equal length (*e. g.*, census periods, either quinquennial or decennial) should be proportional to the initial populations upon which they are based.

In Michigan (and in certain other states), owing to the effect of immigration, interstate migration, variations in the rate of natural

increase, or other factors, the annual increments or other periodical increments of population are not proportional to population, and, consequently, the geometric method is not applicable to the estimation of intercensal populations in Michigan and certain other states.

(2) In addition to its assumption of a law of increase in geometric ratio through the years of a census period, which, as stated above, does not hold good for Michigan (and certain other states), the geometric method further assumes, when applied to postcensal estimates, that "the same rate of increase will hold good as in the previous intercensal period."— (Newsholme, *Vital Statistics*, p. 4.)

This assumption is utterly untrue for Michigan and certain other states,— the rule being that the rate of increase rapidly changes from one census period to the next, and, therefore, the geometric method is especially inapplicable to the estimation of postcensal populations.

I cannot attempt, in the limited space at my disposal, to show the precise application of these principles to the estimation of population in Michigan except in a general way. I may be permitted to quote in this connection, especially as the reviewer seems to have entirely ignored it, a paragraph from the *Registration Report* which seems to me to present a full and satisfactory explanation for the rejection of the geometric in favor of the arithmetic method of estimation in the special case of Michigan.

In brief the growth of this State in population for the past thirty years has been so much affected by immigration, and also, probably, to some extent by the decreasing rate of natural increase, that the geometric formula applicable in states and countries which increase chiefly by natural increase does not correctly express the relations of the increments of population for successive years. The crucial test of the applicability of this formula is whether the State does, or does not, as shown by successive census enumerations, show an amount of actual increase of population proportioned to the initial population shown by the preceding census. The increase of population in Michigan from 1880 to 1890 was 456,952. This number, based upon an initial population of 1,646,937 in 1880, is practically the same as that shown for the decade 1870–80, or 452,878, which was based upon an initial population, in 1870, of only 1,184,059. As showing that the same conditions yet prevail, the net increase from 1890 to 1894, 147,565, may be compared with that from 1880 to 1884, 216,721. As the increase of population in successive census periods is not at all proportioned to the populations at the beginning of these periods, so the assumption that the latter years of any intercensus period would show a larger amount of increase than the earlier years,

because based upon a larger number of inhabitants, is clearly untenable, and the application of the geometric method, which postulates such proportional gain as population increases, to the estimation of population in in states where such conditions obtain, is *mathematically absurd.*

Besides the above objections to the use of the geometric method in estimating the population of Michigan, I found, in applying it practically, that it was productive of serious cyclical errors, and irregularities affecting series of vital rates that extend from one census decade to another. This is a result of the rapidly decreasing decennial rates of increase. It is the defect of the geometric system as applied to populations undergoing rapid and irregular changes that it sets up a series of periodical waves within census periods, and causes "faults," using a geological analogy, that in nowise exist in the data themselves, in passing from the rates of one decade to the next.

The arithmetic method is the simplest of application, especially to the subdivisions of a state; is easily understood by the public and executed by clerks and in small registration bureaus where the geometric method, simple as it is, would not be practicable; carries with it no implied belief in the Malthusian doctrine of geometric progression of population, which is very far from the truth in this country at present; and, lastly, most important of all, is demonstrably as correct in its estimates, or even more so, than the geometric method, both being tested by the predicted results of census enumerations.

The last claim, which is the gist of the matter, I think I have proved for Michigan in recent Registration Reports. Mr. F. S. Crum has proved the superiority of the arithmetic over the geometric method even in the case of Massachusetts (in these *Publications*, December, 1895), a state for which I should have been inclined to concede the superiority of the latter on *a priori* grounds. Of course it might be possible, by going back a hundred years and thereby getting a very small average annual increase as compared with the growth of the state at present, to obtain some very absurd results by the arithmetic method; but the absurdity would lie chiefly in the error of taking an average annual increment based upon an unduly long period, instead of employing the average annual increments of adjacent decennial or quinquennial periods.

The statistical authorities that have pronounced in favor of the geometric method are mostly those of Europe or of the densely settled Eastern States, whose conditions of growth are very similar to

those of Europe. Dr. Farr's method has not flourished out of Europe. In Australasia, where English methods and English principles might be expected to have full sway, and where English nomenclature and forms of presentation of registration statistics are closely followed, the geometric method of estimating population has been unqualifiedly rejected,— not in favor of the arithmetic method, but for a plan of computation based upon natural increase and balance of migration, a method preferable to either if only accurate vital statistics and statistics of travel are kept. Even for England had the registrar-general employed the arithmetic method for estimating populations between the years 1881–91, his results would have corresponded more closely to the corrected figures for the latter years of the decade than did those obtained by the geometric method.

It has not been my purpose to prove the general superiority of the arithmetic method from its special application to a few favorable cases. Rather, it has been my intention to oppose the dogmatic assumption that the geometric method, because it has been found applicable to certain conditions of growth of population, is necessarily the "standard" method, which must be applied to all alike under penalty of being pronounced unscientific. Neither the arithmetic nor the geometric method "if correct for one is equally correct for all conditions." The only criterion of the value of a system of estimation is its conformity with census results, and, while I believe that for most of the states of this country at present the arithmetic system will be found to give the most reliable results when so tested, I am quite prepared to believe that certain states may find the geometric method the most satisfactory of all, or that the method of natural increase, or a combination of this method with that of the arithmetic method, as used in the admirable Swedish tables of Berg,* may give still better results.

C. L. Wilbur, M. D.,
Division of Vital Statistics, Dept. of State, Lansing, Mich.

* *Några Grundrag af Sveriges Befolknings-statistik för åren 1748–1875.* Stockholm, 1878. Table 1.

Municipal Plants.	Average Number Commercial and Domestic Lamps.	Charges for Commercial Lights. Incandescent, 16 Candle-Power.	Average Number of Public Lamps.	Hours per Night.	Nigh per Mont
Braintree	3,000—16	6 mills per lamp-hour (estimated $5.61 per year, 3 hours daily)	90—1,200 104—25	7.6	26.6
Danvers	None		81—1,200	5.7	23.0
Hingham	3—25 2,504—16	20 cents per kilowatt-hour (estimated 1 cent per lamp-hour)	324—32	5.6	23.3
Hull	3,808—16 2—1,200	60 cents per month	215—25	5.3	27.3
Marblehead	1,210—16	½ cent per lamp-hour; 1 and 1½ cents summer residents	41—25 149—1,200 to 2,000	5.6	25.7
Middleborough	1,656—16	1 cent per lamp-hour ($9.36 per year, 3 hours daily)	105—1,200 402—16	7.0	26.5
N. Attleborough	1,316—10 to 16 42—32	½ cent per lamp-hour ($6.02 per year, 3 hours)	578—16	5.0	26½
Peabody	1,700—16 1—1,200	½ cent per lamp-hour; ¼ cent above 50 lamps	150—1,200	9.7	30.4
Wakefield	1,650—16	$12 per year; 1 cent per ampere-hour	97—1,200	4.9	23.3

* Peabody, averaging 9.7 hours, is esti

Private Plants.	Average Number Commercial and Domestic Lamps.	Charges for Commercial Lights.		Average Number of Public Lamps.	Hours per Night.	Nights per Month.	Capi and Debt
		Incandescent, 16 C.P.	1,200 Arc, per Year.				
Andover	150—10 2,565—16	24 cents per kilowatt-hour (estimated 1.4 cents per lamp-hour.	.....	66—25 28—1,200	5.8	25.6	$30,0 29,2
Blue Hill	2,900—16 300—32	$10 per year	.....	66—32 46—1,200	7.9	28.2	30,0 29,3
Gardner	49—1,200 3,500—16	$10.50 per year, 6 nights	$70 to $77	13—25 51—1,200	4.2	23.4	30,0 ....
Leominster	30—1,200 4,252—10 to 20	$10 per year until 10 P.M.	$72 until 11 P.M.	63—25 59—1,200	6.3	26.0	50,0 85,3
Marlborough	58—1,200 2,889—16	$12 per year until 9 P.M., 6 nights	$90	1,500—25 56—1,200	6.6	30.4	30,0 70,0
Milbury	1,092—10 to 32	$10 per year	.....	6—32 26—1,200	4.7	25.7	17,0 16,0
Northampton	30—1,200 5,000—16	$10 per year until 9 P.M., 6 nights	$75 until 10 P.M.; $100 all night.	132—1,200	....	26.0	58,7 72,2
Salem	8,482—6 to 25 38—1,200	20 cents per kilowatt-hour; 1.2 cents per lamp-hour.	$138 until 11 P.M., 7 nights	613—25 181—2,000	9.9	30.4	175,0 79,0
Whitman	2,220—16	$10 per year until 10 P.M.	$60	115—25 27—1,200	4.7	21.6	35,0 25,0

Hours per Night.	Nights per Month.	Cost of Plant.	Operating Expenses.	Interest Paid.	Commercial Income.	Net Cost of Public Lamps (Excluding Interest).	Estimated Cost of Same Lamps at $15 for 25 C.P., $12 for 16 C.P., $80 for 1,200 C.P.,—6.5 hours.	Began Operations.
7.6	26.6	$56,206	$9,145.92	$660	$4,122.79	$5,023.13	$8,760	1892; commercial, October, 1894.
5.7	23.0	16,562	3,690.41	....	.....	3,690.41	6,480	1889
5.6	23.9	22,995	8,528.80	680	4,767.10	3,761.70	7,776	1893
5.3	27.3	90,972	6,980.73	....	2,607.49	4,373.24	3,225	October, 1894
5.6	25.7	73,065	3,550.04	....	572.58	2,977.46	12,535	1894
7.0	26.5	80,217	9,731.97	3,060	3,526.61	6,205.36	13,224	1894
5.0	26½	51,092	7,818.91	....	3,476.59	4,342.32	6,936	1894
9.7	30.4	58,649	10,719.49	....	2,949.65	7,769.84	15,000*	1893
4.9	23.3	157,257	9,336.02	....	4,021.25	5,314.77	7,760	1894

hours, is estimated at $100 per year.

ghts er nth.	Capital and Debt.	Total Capitalization.	Operating Expenses.	Interest Paid and Due.	Total Income. Light and Power.	Taxes.	Price Paid for Public Lamps per Year.		Dividends.	Rate.
							Incandescent.	Arc.		
.6	$30,000 29,275	$59,275	$9,193.48	$2,383.19	$10,820.13	$335.92	$3,700 for 31 arcs and 73 incandescents.....		None declared.	....
.2	30,000 29,327	59,327	6,990.98	3,638.00	9,931.55	42.38	$24.00	$90.00	$1,800	6
.4	30,000	30,000	9,782.19	12.48	13,676.59	601.47	15.00	75.00	2,500	8½
.0	50,000 85,385	135,385	14,239.79	13,680.78	17,915.33	908.84	16.00	72.00	None declared.	....
.4	30,000 70,000	100,000	15,666.77	3,663.01	20,607.13	1,044.48	17.50	90.00	None declared.	....
.7	17,000 16,000	33,000	4,105.96	270.51	6,098.49	270.51	20.00	75.00	$340	2
.0	58,700 72,200	130,900	16,001.96	4,475.83	22,293.13	675.26	.....	86.25 all night.	1,174	2
.4	175,000 79,000	254,000	56,045.26	3,413.52	83,492.82	3,413.52	24.00	40 cents per night ($146 per year)....	10,500	6
.6	35,000 25,000	60,000	7,248.22	619.30	11,066.01	619.30	12.50	$80.00	None declared.	....

REVIEWS AND NOTICES.

ELECTRIC LIGHTING PLANTS.

Eleventh Annual Report of the Board of Gas and Electric Light Commissioners of the Commonwealth of Massachusetts. 1896. Pp. 170, clx.

This report gives for the first time certain detailed accounts of the new municipal lighting plants of Massachusetts, accompanied by the reports from private companies. Under the legislation of 1891, 12 towns in the state have built or purchased plants, 10 of them furnishing electric light only, and two gas and electric light. There are 131 private corporations reporting to the Board, 47 of which furnish gas only, 24 gas and electric light, and 60 electric light only. In the accompanying table 9 municipal plants, which are in working order, are compared with 9 private plants of nearly corresponding size. Six of the municipal plants can scarcely be said to be representative, since they began operations at various dates in 1894, and the reports to the Board are for the fiscal year ending June 30, 1895.

There is a much larger variety of charges in the private plants than in those owned by municipalities, discounts being made on large purchases and prompt payments, which do not exist in public plants. The figures given as charges for lights by private companies are in all cases the lowest charges after deducting published discounts.

In order to work out completely the comparative merits of the two systems the student needs, besides the data given in the report, information upon the rates of interest paid on bonds by the municipalities and also by private companies. The report gives "interest paid" and "interest due," but the two items are evidently not the interest charges for the year. To what extent the lack of dividends in four of the companies cited is owing to heavy bonded indebtedness and interest charges, could then be ascertained. The "interest paid" by municipalities is plainly not the total interest chargeable to the "cost of the plant." The report gives the tax rate in the 12 towns owning plants, but not in the towns with private plants. It is also important to know the number of employees, wages, and hours of labor in the two sets of plants.

Illustrating the practical results of state control over private corporations, the report states that applications were made for stock and bond issues $1,948,200, of which $1,466,400 was approved (p. 20). An application to issue $60,000 stock for patents was refused. In the case of the Brockton Gas-Light Co. the price of gas was fixed by the Board at $1.50 per 1000, upon the principle that "the profits of companies supplying this kind of service must compare favorably with those which a new company might need to pay a fair dividend when fully equipped to render the same service." This company had over-issued stocks and bonds for speculative purposes, and had erected a plant for trying a new process of manufacture at a cost of $78,500, which proved to be a failure. The Commissioners say relative thereto: "Consumers have a right to demand that profits in corporations of this character shall come from the legitimate exercise of their charter powers, and not from speculative manipulations of the stock, even though under the forms of law. The burdens of reckless management belong to the corporation and not to the public" (p. 14).

The average price for coal gas in Massachusetts has been —

1886, ...	$1.72	1891, ...	$1.31
1887, ...	1.66	1892, ...	1.38
1888, ...	1.56	1893, ...	1.27
1889, ...	1.45	1894, ...	1.26
1890, ...	1.39		

While two municipal lighting plants were constructed in 1894–95, there were 11 new private plants.

J. R. Commons.

INQUIRIES CONCERNING POVERTY.

Das Armenwesen in Steiermark. By Dr. Ernst Mischler, Director des statistischen Landesamtes von Steiermark. Graz, 1896. Pp. 258.

This is a most careful and thorough study of the conditions of poverty in Steiermark, based on a census taken in 1892, and a special investigation carried on in 1894–95. The general purpose of this special investigation was to secure facts throwing light on the probable effect of adopting such socialistic measures as old age pensions and insurance against sickness and accident, but the report confines

itself rather closely to the presentation of actual conditions, drawing very few conclusions therefrom. Full details are given as to the number of persons receiving public aid, the kind and extent of aid given, tendency to increase or decrease in the number receiving each kind of aid, cost of aid given, and so on. This part of the work contains numerous carefully prepared tables and ten cartograms, which are especially clear and effective.

The latter part of the work is devoted to the causes, personal and social, of poverty. The statistics bearing on this point are taken only from those who are receiving permanent aid, since it is too difficult to secure reliable data concerning those who receive temporary help. The calculations concerning the personal causes are based on 4790 cases of adults receiving permanent aid varying from total support to a small allowance. The three main causes are old age, causing 38.2 per cent of the whole number; physical infirmities, accounting for 27.3 per cent; and accident and sickness, causing 5.10 per cent. "These three causes are those which it is the special object of the socialistic insurance against age, infirmity, sickness, and accident to remove. According to the foregoing figures, some 70 per cent of the existing cases of poverty would have been provided for by such legislation, a fact which sets forth in the clearest light the need for such measures and their far-reaching importance."

The social causes for poverty are the general ones,—the breaking up of the old industrial system, the tendency of population toward the cities, the growth of a tramp class, unrestricted marriage among people entirely unprepared to support their families, and the decline of some forms of agriculture being among the most important. No remedies for these causes are suggested.

M. K. Conyngton.

Beitrage zur Statistik des Herzogthums Braunschweig. Herausgegeben vom statistischen Bureau des herzogl. Staatsministeriums. Heft XII. 1895.

This report gives the results of the census taken in Brunswick in 1890–91. It is prepared with characteristic German thoroughness, and, in addition to the fullest possible information respecting the age, sex, religion, and conjugal condition of the inhabitants, gives also a census of the dwelling houses in the Duchy, classified according to

the number of occupants. The results of the census are also compared with the same statistics for 1790.

The report does not contain much of general interest. Here, as elsewhere, the movement of the population from the country to the city appears, but it is far less marked than in our own country. During the century the population of Brunswick has increased 104.5 per cent; the increase of the urban population was 188.9 per cent, and of the rural population but 68.4. Comparison with the results of the censuses taken throughout the century, however, shows that the increase of the urban population was most rapid in the earlier part of the century, and that, though the number of the inhabitants of the cities is increasing more rapidly than that of the country districts, the proportionate increase has been growing smaller since about 1850. No reason is given for this change.

The increase in the number of houses has not kept pace with the increase in the number of inhabitants. While the population has increased 104.5 per cent, the number of houses has increased but 67 per cent. In other words, in 1790 the average number of occupants to a house was 7.6, while in 1890 it was 9.2.

The report contains also four excellent colored charts showing the density of population throughout the Duchy in 1790 and in 1890, the percentage increase in the number of inhabitants and in the number of houses.

Appended to the report is a treatise: *Der Einfluss der neueren socialpolitischen Gesetzgebung auf die Armenpflege im Herzogthum Braunschweig*, by Finanzrath Dr. F. W. R. Zimmermann, Vorstand des statistischen Bureaus des herzoglichen Staatministeriums. This treatise gives the results of an enquiry made to determine what influence such socialistic measures as old age pensions and insurance for workers against sickness and accident have had upon the public expenditures for charity. To really determine how far this influence is felt would have required such an expensive and laborious investigation that it was not even attempted, and the Government contented itself with sending out requests for information as to the actual amounts expended for charitable purposes during each of the ten years from 1884 to 1893, inclusive, and the numbers of persons for whose benefit they were used.

In 1884 the number receiving aid from the state was 5121. For some years this number decreased, reaching 4933 in 1889, and 5033

in 1890. For the next two years it increases, reaching 6212 in 1892, but again shows a slight falling off the next year, being only 6162 in 1893. This increase is the more striking, as 1890, the year in which it begins, is the year in which the laws relating to the insurance of the workers first became fully effective. The expenditures for charitable purposes during this period show a marked and, on the whole, a steady increase, rising from 286,801 marks in 1884 to 392,676 marks in 1893.

The special object of the enquiry had been to find out whether the action of the new socialistic legislation had had any effect in lightening the burden of charitable work. At first sight the figures quoted above would seem to indicate that this had not been the case, but Dr. Zimmermann considers that there is ample ground for drawing an opposite conclusion. The increase in the number of those receiving aid, 1091, is much smaller than was to have been expected, in view of the increase in the population and of the hard times prevailing from 1890 onward. The steady increase in the amounts expended for poor relief is likewise smaller than would naturally result from the extension of the field of relief that has taken place during the decade, and the increasing cost of the necessaries of life. Considering these facts it seems certain that while these socialistic measures have not directly diminished the burden of poverty they have done so indirectly by preventing its increase.

A request was also sent out to those engaged in administering the public charities that they would state the effect in their district of the new socialistic legislation on the expenditures for charitable purposes. Answers were received from 32 cities and country districts. Eight either said that the legislation was still too recent for its effects to have become apparent or gave indefinite replies. Nine returns, received from communities containing a total population of 14,136, denied that the new laws had had any effect whatever on the matter of poor relief. Fifteen returns, representing a total population of 161,825, asserted that they had had a favorable influence on the expenditures for charity, though different places ascribed varying degrees of usefulness to the three forms of insurance,— sick benefit, old age pensions, and insurance against accident. These results show clearly the greater effectiveness of such measures in the cities, where the artisan class is naturally stronger than in the country.

In many respects the investigation was scanty and superficial, but its results seem to justify the opinion that while it will not be possible to obtain statistical proof of the effect of the socialistic legislation on the cost of poor relief until the lapse of a longer time shall have made its effect more apparent, there is good reason to believe that these new measures have already exercised an important influence in preventing the increase of the expenditures for charity which would otherwise have been necessary.

M. K. CONYNGTON.

RAILWAY STATISTICS.

Forty-Third Annual Report of the Railroad Commissioners of Connecticut for the Year Ending September 30, 1895. Hartford. Pp. 500, 116.

During the year the number of passengers carried showed a falling off of 582,613, or about one per cent. This reduction was caused by the competition of the electric roads. The total number of tons of freight transported increased a little over one-tenth. The relation of the unemployed to fatal accidents on railways is indicated by the fact that the number classed as trespassers injured during the past year on the railroads was but 150 as against 175 the previous year. Of this number more than one-half, or 78, were killed.

Eighteenth Annual Report of the Board of Railroad Commissioners of Iowa for the Year Ending June 30, 1895. Des Moines, 1895. Pp. xl, 316.

Complaint is made of the difficulty in obtaining information from railway companies that will disclose the working of the system of railroad transportation within the state. Detailed statements, consequently, of the operation of roads as limited by state lines are little more than an approximation. In the Appendix is given a valuable index of all the volumes thus far published by the Commission from 1878 to 1895, inclusive.

Thirty-Seventh Annual Report of the Railway Commissioners of Maine for the Year Ending June 30, 1895. Augusta, 1895. Pp. 59, 155, 391.

New railroad construction in Maine during the year ending June 30, 1895, was 110 miles, making a total of 1626 miles now operated.

In this computation only the main line and branch tracks are taken into consideration. There was a falling off in the number of passengers carried of 309,377, or a little over 5 per cent of the total. This is a continuation of the decrease of the preceding year. There was an increase, however, in the number of passengers carried one mile, the number being the largest on record, amounting to 128,941,645, an increase of 8,211,298. There was an increase in the gross transportation earnings and the number of tons of freight carried.

The return of the street railroads show a continuous increase in the passengers carried and earnings. The increase in the number of passengers carried during the past year was about 12 per cent.

During the year there were two passengers killed and 11 injured; 9 employees killed and 35 injured, a favorable record as compared with the rest of the country.

Twenty-Third Annual Report of the Commissioner of Railroads of Michigan for 1895. Lansing. Pp. lxi, 454.

It is demonstrated here also that there are many misleading statistical statements in this series of reports, owing to the fact that many railroads doing business in the state are located partly within and partly without the state, and there is not an accurate separation of the respective accounts. For the first time a table is published, showing the earnings of Michigan railroads in detail, both as to rate per ton per mile and rate per passenger per mile. The earnings during the year 1894 were 19.03 per cent less than in 1893. The number of employees was 23,458, a decrease of 3307 from 1893. Interesting tables are given on taxation of railroads, the total amount paid being $676,136. This was a decrease of 16.63 per cent from the preceding year. Michigan railways pay $89.30 taxes per mile of road.

Fifth Annual Report of the Board of Railroad Commissioners of North Carolina for 1895. Pp. xiii, 712.

A distinctive characteristic of the reports in North Carolina are the tables of valuation and assessment of railroad property as a whole and by towns. The valuation is also given of Pullman cars on the various lines and the telegraph companies. The larger portion of the report is devoted to the detailed accounts of various roads.

LABOR STATISTICS.

Fourth Annual Report of the Bureau of Industrial Statistics of Maryland, 1896. A. B. Howard, Jr., Chief. Baltimore. Pp. 170.

The principal topics dealt with are Personal Property Values, Building and Loan Associations, and Strikes and Lockouts. An original investigation was made with regard to the values of personal property through the records of the Orphans' Courts of various counties. This is a continuation of the investigation made the preceding year.

"During the period from 1890 to 1894, inclusive, there were 5622 estates probated, of which 16, or .3 per cent were over $100,000, aggregating $9,455,844, or 41.4 per cent of the total value.

"The number of estates under $10,000 was 5312, or 94.5 per cent of the whole, and aggregated $6,664,803, or 29.2 per cent of the total value. The number of estates over $10,000, including those over $100,000, was 310, or 5.5 per cent of the whole, aggregating $16,154,994, or 70.8 per cent of the total value. This means that 310 estates aggregated 70.8 per cent of the total value, while 5312 estates aggregated but 29.2 per cent of the total value."

Thirteenth Annual Report of the Bureau of Labor and Industrial Statistics of Michigan. Lansing, 1896. Pp. xxvi, 402.

The special topics taken up in this report are street railways, laborers engaged in transportation, and some historical sketches of organized labor. This volume also serves as a general statistical volume, as there are digests of miscellaneous statistics taken from other state documents. The returns are presented in the detailed individual form, with summaries at the close. Individual returns are given from 1865 street railway employees; 3134 employees of hack and bus lines; and 1943 owners who drive their own hack, bus, dray, or team. Among the 44 questions asked these individuals was information as to the influence of foreign immigration upon present occupation. The answers to this, and also as to the advisability of restricting foreign immigration, constitute an interesting referendum. The returns are as follows: —

	Street Railway Employees.	Employees of Hack, Etc.	Owners of Hacks, Etc.
Number who say foreign immigration injures present occupation	1,493	2,009	1,235
Number who say foreign immigration does not injure present occupation	310	776	538
Number in favor of restricting immigration	1,792	2,616	1,748
Number not in favor of restricting immigration	61	270	129

Third Annual Report of the Inspector of Factories in Michigan. Lansing, 1896. Pp. 260.

The total number of factories inspected was 3137. Statistical comparison is made between the actual and maximum running capacity of factories. The total number of accidents reported was 253, of which 43 were fatal; of these 23 were boiler explosions.

The *Tenth Annual Report of the State Board of Conciliation and Arbitration of Massachusetts* for 1895 contains reports and decisions on 32 cases, and in the Appendix there is a useful compilation of the state laws providing for mediation and arbitration in the United States.

The *Revue de Travail*, published by the *Office du Travail* of Belgium, began its monthly publication with the number of January, 1896. Each number has 104 pages. In No. 1 are published the results of an inquiry on non-employment, taken during the winter of 1894–95. Considerable attention is given to labor legislation, not only of Belgium, but of other countries.

A recent return has been made of accident and sickness insurance of Germany. There is an increase in the number of persons receiving relief. The statistics are as follows: —

Year.	Cases of Sickness per 100 Members.	Days of Sickness per Member.
1888	32.6	5.5
1889	33.2	5.4
1890	36.8	6.0
1891	34.9	5.9
1892	35.6	6.1
1893	39.3	6.5

In the *Labor Gazette* for March, 1896, is a compilation of fatal accidents in coal mines in the United Kingdom between 1851 and 1894.

TABLE GIVING FOR EACH QUINQUENNIAL PERIOD SINCE 1851 PARTICULARS OF THE AVERAGE DEATH RATE DUE TO ACCIDENTS OF VARIOUS KINDS IN MINES.

Period.	Death Rate from Accidents per 1000 Persons.				
	Employed Under Ground.				Employed Above Ground.
	Explosions of Fire-Damp or Coal Dust.	Falls of Ground.	Accidents in Shafts.	Other Accidents Below Ground.	
1851-55	1.280	2.016	1.286	.556	1.012
1856-60	1.234	1.846	.899	.648	.994
1861-65	.618	1.714	.668	.790	1.105
1866-70	1.158	1.578	.528	.730	1.256
1871-75	.516	1.210	.437	.572	.899
1876-80	.811	1.132	.317	.449	.847
1881-85	.408	1.108	.263	.532	.848
1886-90	.312	1.015	.196	.517	.913
1891-94	.281	.806	.194	.434	.814

"It will be noticed that for two of these classes of accidents, *viz.*, those caused by falls in the ground, and those taking place in shafts, the death rate has grown steadily less for each successive quinquennial period. The deaths from explosions, though subject to some fluctuations, also shows, on the whole, a distinct tendency to decrease."

CIRCULATION OF MONEY.

La vitesse de la circulation de la monnaie. By Pierre des Essars. *Journal Société de Statistique de Paris*, April, 1895; p. 143.

In this article M. des Essars points out that the use of money depends on two factors,— quantity and rapidity of circulation,— the product of these being the "quantity of movement." The recognition of this law has led the great commercial nations to increase artificially the circulation of their money by means of banks and clearing houses. As the greater part of the monetary transactions are affected through banks by means of running accounts, we can trace the velocity of a quantity of money by a study of the movements at the banks.

The funds received on deposit at the banks are called *credit.* Through a system called clearing, banks may transfer to a new account all or a part of a credit and thus effect, without the use of either specie or notes, a large number of payments. The amounts paid on clearings or checks are the *debit* of running accounts. The difference between credit and debit is the *balance of account.* It is the balance of account which changes from hand to hand, and is the active part of running accounts. As a debit and a credit represent a completed payment between two individuals, we can formulate the following law: —

Half the sum of the total annual debit and credit of a bank expresses the yearly quantity of movement of the average balance.

This sum, therefore, divided by the balance, gives the yearly number of payments effected by the money employed in the bank, *i. e.*, its rapidity of circulation. In financially sound countries this often exceeds one hundred.

Years.	Bank of France.	Bank of Germany.	Bank of Belgium.
1890	135	190	146
1891	138	170	141
1892	116	148	130
1893	120	165	118
1894	127	161	129

In financially backward countries the low figures express the feebleness of the exchanges.

Years.	Bank of Portugal.	Bank of Spain.	Bank of Italy.	Bank of Greece.
1890	54	16	36	4
1891	22	14	30	5
1892	18	13	25	4
1893	18	14	29	3
1894	12	15	29	3

The figures given relate to non-interest bearing accounts. With those that bear interest the movement is much slower, owing to the fact that the depositors of such funds live upon the interest of their deposits, and do not draw on the capital for use in business. Thus the payment of interest has a retarding effect upon the business of a

bank. We find that for this class of deposits the rapidity of circulation in the Bank of Russia is about 9 and in the Bank of Italy about 5. It is therefore apparent that the adoption of the policy of paying interest by the great banks would diminish their power to economize the use of money. If, for instance, in 1893 the rapidity of the circulation of the Bank of France had been the same as that for the *Credit industriel et commercial*, or 30 instead of 130, the balance necessary to effect a movement of 48,809 millions would have been 1577 millions. As it was, the bank required only 405 millions, so that there was a saving of 1172 millions which could be put to other uses. If, on the other hand, the Bank of France knew how to give its funds the rapidity of circulation enjoyed by the Bank of Germany, it would need a balance of only 295 millions.

Statistics show that the experiences of the Bank of France have followed very closely the succession of crises and liquidations. M. Juglar has shown that certain phenomena always accompany a crisis: (1) The discounts of banks of issue reach a maximum; (2) the reserves reach a minimum; and (3) importations are at the maximum. Liquidations or forced payments follow until the crisis is broken. Now comparison of the movements of the curve expressing the rapidity of circulation in the Bank of France for 85 years, with a series of 25 alternating crises and liquidations brought to light by M. Juglar, shows that in every case the velocity of movement reaches a maximum at the moment a crisis appears, and a minimum at the point of liquidation.

From this the author believes it not impossible to use the statistics showing the current rapidity of circulation as a kind of social barometer; a high reading presaging fair weather, that is, prosperity and commercial activity, a low reading indicating the reverse.

ANITA CORBERT.

Stanford University, Cal.

VITAL AND HEALTH STATISTICS.

Fifty-Seventh Annual Report of the Registrar-General of Births, Deaths, and Marriages in England, 1894.

The population for the middle of the year 1894 is estimated at 30,060,763. The marriage rate was 15.1 per thousand living. This

is a slight increase from the very low rate of 1893, which was 14.7. The birth rate was 29.6 per thousand persons, this rate being the lowest on record. The death rate was 16.6 as compared with 19.2, which was the average rate for ten years immediately preceding. The death rate for 1894 was the lowest on record, the lowest previous rate being 18.1 in 1888.

In the *Thirteenth Annual Report of the Superintendent of Health of the City of Providence* for 1895 reference is again made to the value of isolation in scarlet fever, and additional statistics are given. The Superintendent is inclined to think that in the majority of cases the children who live in a house where there is scarlet fever, but not in the family with it, may be allowed to attend school. In crowded tenements and among ignorant people this privilege must be withheld. This will, perhaps, mean about one-fourth of all cases. Statistics are given to bear out this statement. Considerable attention is given to the statistics of diphtheria and the use of anti-toxine. Fewer persons were vaccinated in 1895 than in any year since 1890, and it is remarked that there seems to be a growing tendency to object to vaccination.

The difficulty of making an intercensal computation is illustrated on page 39. The census population for June 1, 1890, was 132,146. For January 1, 1893, it was estimated that the population would be 148,944. The census of June 1, 1895, however, showed a population of but 145,472.

In the *Eighteenth Annual Report of the Board of Health of Lowell for 1895*, attention is also called to the difficulty of estimating the intercensal population for that city. The city Board of Health had estimated the city population of Lowell for 1893 as 87,191, and the population for 1894 as 90,613. The State census, however, of 1895 gives the population at only 84,359. A recomputation, therefore, of death rates for intervening years is necessary, and shows a considerable increase. The death rate for 1894, as given in the report for 1894, was 19.69. On recalculation, however, it is 21.38.

Twenty-First Annual Report of the Secretary of the State Board of Health of Michigan for the Year Ending June 30, 1893. Lansing, 1895. Pp. cxxiv, 444.

For the statistician, the most interesting portion of this report is the statistical study of sickness in Michigan in 1892. This study is

the sixteenth of a series upon the same general subject begun in 1876, and presents a summary of the compilation of weekly reports of sickness in Michigan in 1892, and includes a series of diagrams which showed by months, in 1892, the rise and fall of 28 of the most prominent diseases in Michigan.

At a meeting of the London Statistical Society, January, 1896, Dr. Arthur Newsholme read a paper on the *National System of Notification and Registration of Sickness.* It was shown that great sanitary improvements had followed from a system of death certificates and registration. Statistical evidence was given, showing the advantage of publicity of the Registrar-General's returns and the consequent efforts on the part of local authorities. Registration of deaths alone, however, give a very imperfect view of the prevalence of disease. The hospital treatment of infectious patients could only be secured, in a majority of instances, through the machinery of compulsory notification of cases. This led to the question of payment of the medical practitioner for notifying each case of infectious disease. The state had no right to require work from private members without giving them a remuneration for it. It was also recommended that the schedule of notifiable diseases should be widely extended. In the discussion which followed there was a general agreement in favor of Dr. Newsholme's recommendation of assistance from the government, though some thought that the proposals went too far.

Fifteenth Annual Report of the State Board of Health of New York. Albany, 1895. Pp. 775. Vol. II, maps and diagrams.

The change in the method of registering birth, marriage, and death certificates by clerks at an annual salary, instead of being paid for by the amount actually done, put into operation February 1, 1893, is referred to as having been successful. Special tables on the epidemic of *grippe* are to be found on page 10.

Thomas Lindsay, in the *Monetary Times* (Toronto, Canada) of March 20, 1896, makes an interesting comparison of the probable ratio of life of members of the Royal Society of London and the experience of the Canada Life Assurance Company. Admissions to the Royal Society are limited to about 15 annually, and the average age at election ranges from 40 to 45. The comparison of Mr. Lindsay is made possible because of the analysis of membership which was

made by Lieut.-Gen. Strachey in 1892. At that time a table was compiled of the ages at election of all fellows admitted between 1848 and 1891. The experience of the Canada Life Assurance Company covers a period of 46 years, recording observations upon 35,287.

The record of the Royal Society is found to be fully as good as that of the Canada Life. It appears that those engaged in scientific pursuits have a longer lease of life than the average. "Brain work is not wearing upon vitality; brain worry is."

In the *Standard*, April 11, 1896, is a table showing the results of life insurance in the United States from the date of the organization of the companies to December 31, 1895. The table includes the insurance of 41 companies.

The gross premiums received since organization has been . .	$2,726,715,898
The gross amount paid policy holders has been	1,827,606,231
The gross assets December 31, 1895, were	1,116,434,143
Payments to policy holders since organization plus present assets amount to	2,944,040,374
The excess of payments to policy holders plus present assets over premiums received	217,324,476

In *Eyesight and School Life*, by Simeon Snell (Bristol, England: John Wright & Co. 1895. Pp. 70.), is a considerable body of statistics on defective eyesight gathered from various sources. The statistics of Munich, Breslau, St. Petersburg, and other cities, gathered by Drs. Cohn, Erismann, and others, are briefly summarized. Some statistics are also added with regard to myopia in this country.

In the *Sixty-Third Annual Report of the Pennsylvania Institution for the Instruction of the Blind*, December, 19, 1895, on page 34, are given statistics with regard to the attendance for the past year. During the year 39 new cases were admitted. Of these, one had a blind uncle, one a blind brother, one a blind grandfather, and one two blind uncles. Among the causes of blindness five are classed as congenital.

ANTHROPOMETRIC STATISTICS OF ITALY.

Anthropometria Militare. By the Ministry of War, under the direction of Dr. Ridolfo Livi. Part I: *Anthropological and Ethnological Data.* Rome, 1896. Pp. 419. Maps and diagrams, xxiii.

This superb piece of work, which has already been referred to in the March number of the *Publications* (p. 38), is the most comprehensive contribution yet made to the anthropological study of the present populations of Europe. Similar work is being done by Dr. Collignon in France, although the government has not definitely undertaken the work, as in this case. The text, the complete table of results, and the maps of the distribution of the stature, color of hair and eyes, and cephalic index, by provinces, and even by communes, reflect the highest credit upon the distinguished author. Statistically the work seems to accord with the highest standards, and in many places, as in the discussion of the interpretation of curves of seriation, the matter of method is peculiarly well treated.

Here are some of the general results of the investigation, neglecting the sociological factors which have been discussed in the above mentioned reference. The population of Italy is of two distinct types. In the north it is predominantly broad-headed (index 86), relatively tall (1.66 meters, while the shortest in the British Isles averages 1.67 meters), and relatively blonde, meaning thereby that about 15 per cent of the eyes and hair are light. In the south, on the other hand, especially in Calabria and Sardinia, the people are generally narrow-headed (average index 75–76), very short of stature (1.63 meters, or about 5 feet 4 inches,— the shortest in Europe), and very dark in complexion. An interesting comparison is made between the distribution of the blonde and brunette *mixed* type and the *pure* types of the same. The figures for the mixed type disregard the combinations of color of hair and eyes in the same person, and are based upon the sum total of hair and eyes of each variety in each district, however combined. In the *pure* type of brunette only those persons are accounted dark who are characterized by pigmentation of both portions of the body. In general, however, the two are parallel. The value of the comparison lies in the fact that Virchow, Schimmer, Kollmann, and Vandekindere have all worked among the Teutons on the basis of the pure type, while Topinard in France, Beddoe in Britain, and others reckon the brunetteness of their several regions by counting in all the dark eyes and hair whether combined in the same individual or not. Each method undoubtedly has its merits; but if they be parallel in results we may combine them to form a general map for all Europe, if only a correct reduction to a common standard can be made.

Dr. Livi has investigated the effects of environment upon physical environment, especially in the determination of the influences of altitude. He finds, for example, the mountaineers are shorter, mainly because their surroundings are less favorable to development (p. 47). The population at considerable altitudes (p. 65) is also lighter in complexion, this being probably also due to social conditions less favorable. Thus, his results accord with our own, expressed at various times, that evidence accumulates to show that the brunette type for some reason is favored by prosperity. In respect of cephalic index, he finds no difference between mountain and plain, attributable to environment, thus contradicting Ranke's famous contention that the Bavarians are original Teutonics, even although they differ radically from them by being broad-headed,— this broad-headedness being but an effect of their extended sojourn at considerable altitudes. In Italy it appears rather that the differences between plain and mountain are merely due to the fact that physical types are more apt to be preserved in purity in isolated places; and, hence, in the south the mountaineer is a clearer type of the Mediterranean dolicho-cephalic race, while in Piedmont he is broader-headed than the people of the plain for the same reason that his broad-headed ancestry is more pure.

Finally, Dr. Livi enters at length into the distribution of other anthropological traits. One of special significance for social students is the unfavorable influence exerted by city life, as indicated by the narrow, weak chests and the stunted stature. Other features, as the nasal index, yield less certain results. This paucity of results from the measurement of facial proportions is also evidenced by Dr. Collignon's latest work on Southwest France. Perhaps it may be that sexual selection, or the existence of local types, upsets the phenomena of race, but at all events research is limiting investigation more and more to a few simple measurements taken on great numbers of people.

This first part of Dr. Livi's work is mainly statistical, consisting principally of remarks upon method, explanation of the tables and the like. It is devoutly to be wished that the succeeding portions of the work, probably to contain the more immediately interesting — though certainly not more valuable — discussion of the bearing of all this evidence on the great problems of the origin, migrations and future of the Italian people may appear in the near future. Meanwhile, this work will stand as a lasting monument to the indefatigable energy and scientific discrimination of the distinguished author.

WILLIAM Z. RIPLEY.

NOTES ON DEMOGRAPHY.

Census of the Commonwealth of Massachusetts, 1895. Horace G. Wadlin. Part I; Vol. 1. *Population and Social Statistics.* Pp. 67. Boston, 1896.

This bulletin contains general population statistics by towns and by sex. There are also tabular analyses of the number of legal voters, comparisons between 1875, 1885, 1895; concentration of population 8 miles, 10 miles, and 12 miles from the State House; a contrast between city and town population; a comparison between city and town population; an estimate of the population for 1905; comparisons of population in certain industrial districts; and a special presentation for the city of Boston by police divisions.

The final count of population of Massachusetts on May 1, 1895, shows that the total population of the state was 2,500,183 instead of 2,495,345, as given out at first. The total number of legal voters in the state is 560,802.

Bulletin No. 12, Census of Michigan. June 1, 1894. *School Attendance.* Pp. 13.

Compared with the number of pupils returned in 1884, there is an increase of 25.41 per cent. The population increased 20.92 per cent in the same time.

Copy of Statistical Tables Relating to Emigration and Immigration from and into England in the Year 1894. Board of Trade. London, April 9, 1895. Pp. 55.

In the appendix there is printed for the first time a tabular account of emigration from foreign countries to places out of Europe. The general conclusions of the report are that as to the whole movement of foreigners into and out of the United Kingdom, the result was to leave the foreign population of the Kingdom unchanged, or with slightly reduced numbers.

The Ministry of the Interior of Russia has published a *Sommaire des Publications Comité Central de Statistique*, which have been published from 1839 down to August, 1895 (pp. 9). There has also been issued by the same office an *Apercu Bibliographique* (pp. 73), and the regulations for taking the first general census of the Empire of Russia, authorized under date of June 5, 1895 (pp. 19).

Mr. R. E. Peary, U. S. N., in a recent address before the American Geographical Society, referred to the influence that contact with civilization had had upon the small tribe whom he has several times visited in northern Greenland. This little community of aboriginal hyperboreans, the most northerly individuals of the human race, numbers 257, completely isolated from all the rest of mankind. "Five years ago many a man possessed no knife and many a woman no needle. Few of the men possessed canoes. Today, men and women are amply supplied with knives and needles; every adult man and half-grown boy has his canoe; most of the men have guns. The effect of these improvements has shown itself at once in the improved condition of the tribe. The death rate has decreased and the birth rate has perceptibly increased within the past five years."

The paper by M. Emile Levasseur on *Historie de la Démographie*, which was presented at the Eighth International Congress of Hygiene and Demography, at Budapest, in 1894, has been reprinted. Pp. 10.

TRADE, INDUSTRY, AND FINANCE.

Report of the Commissioner of Navigation to the Secretary of the Treasury. 1895. Washington. Pp. 360.

The principal point of statistical interest in this volume is the noting of the changes in tonnage brought about by the new measurement law of March 2, 1895. It is remarked: "Statistical science has been the gainer, for so long as net tonnage meant one thing in one country and something else in another country, statistical comparison of navigation in terms of net tons had variable meanings." By the new measurement, in some instances, vessels which were slightly over five tons net by the old law have become less than five tons net under the new law.

The number of sailors of American nativity is still decreasing. The shipment of Americans has fallen from 22,143 in 1893–94 to 21,881 for the last year. The shipment of Scandinavians increased over 2000. Scandinavians shipping at the four ports of Maine exceeded the Americans.

Number 7, Series 1895–96, of the *Monthly Summary of Finance and Commerce* of the United States (January), published by the Bureau of Statistics, Treasury Department, Washington, contains four diagrams on the (1) cotton crop of the United States, by states, for 1870 and 1895; (2) exports of domestic cotton; (3) imports of coffee; and (4) monthly production of gold in South Africa for 1888–95. The special statistics of this number relate to the imports of coffee by countries, 1886–95; the imports and exports of gold and silver by countries, 1864–95; the Philadelphia quotations of wool by months from 1890–96; the prices of wool in the London market, 1886–95; and the production of gold in South Africa by months from 1888 to 1895.

Number 8 of this Series contains detailed statistics of the receipts and expenditures of the Government from 1879 to 1893, also annual appropriations made by Congress from 1873 to 1896. There are two diagrams on the net expenditures and net ordinary receipts from 1866 to 1895.

The March number has three diagrams on the imports of raw cotton and its manufactures from 1870 to 1895, trade with American countries in 1890 to 1894, and exports of wheat and wheat flour from 1886 to 1895.

In the *Financial Chronicle*, April 11, 1896, page 667, is a compilation of statistics of the savings banks of New England and New York from 1870 to 1895, inclusive. The statistics for 1895 are as follows:

	Banks.	Depositors.	Total Deposits.
Maine	52	160,216	56,376,144
New Hampshire	67	163,702	66,746,703
Vermont	39	97,486	30,403,264
Massachusetts	187	1,302,479	439,269,861
Rhode Island	35	135,252	68,732,903
Connecticut	90	346,758	143,159,123
New England States	470	2,205,893	804,687,998
New York	126	1,695,787	691,764,503
Total, New York and New England	596	3,901,680	1,496,452,501

New Hampshire is the only state which shows a falling off in the total deposits between 1894 and 1895. This is a continuation of the decrease from 1893. Rhode Island has not yet recovered to the maximum point of 1892. The statistics for Vermont include trust companies as well.

The *Sixteenth Annual Report of the Directors of the American Bell Telephone Company for the Year Ending December 31, 1895* (Boston), contains an interesting summary of the output of telephones from 1884 to the close of the year 1895. The following statistics illustrate the growth: —

Instruments in the Hands of Licensees Under Rental December 20th.		Total Miles of Wire January 1st.		Total Employees January 1st.	
1884	325,574	1884	85,896	1884	4,762
1885	330,040	1885	101,592	1885	5,168
1886	353,518	1886	114,046	1886	5,538
1887	380,277	1887	128,231	1887	5,843
1888	411,511	1888	146,438	1888	6,183
1889	444,861	1889	170,471	1889	6,310
1890	483,790	1890	193,213	1890	6,758
1891	512,407	1891	240,412	1891	7,845
1892	552,720	1892	266,456	1892	8,376
1893	566,491	1893	307,791	1893	9,970
1894	582,506	1894	353,480	1894	10,421
1895	674,976	1895	396,674	1895	11,094
....	.....	1896	459,728	1896	11,930

The estimated number of exchange connections daily in the United States, made up from actual count in most of the exchanges, is 2,351,420, or a total, per year, of about 757,000,000. The number of daily calls per station varies in different exchanges from 1 to $16\frac{3}{10}$, the average throughout the United States being $8\frac{1}{3}$, which shows a slight decrease from last year in the average use made of the telephone by each subscriber, due to the introduction of the Measured Service system. The average cost to the subscriber varies, according to the size of the exchange and character of the service, from less 1 to $10\frac{2}{10}$ cents per connection.

In the *Engineering and Mining Journal* of April 11, 1896, is an abstract of statistics of mineral and metal production of the United States for 1895, which has been collected for Volume IV,—*The Mineral Industry, its Statistics, Technology, and Trade.* The total net value of this product was $628,689,505, an increase of $84,226,503, or 15.5 per cent over 1894. Of this increase $9,000,000 is represented by anthracite coal, $22,000,000 by bituminous coal, $9,000,000 by iron ore, $37,000,000 by pig iron, and $7,000,000 by gold.

The New York Association for Improving the Condition of the Poor has issued, as Pamphlet No. 1, *An Inquiry into the Causes of Agricultural Depression in New York State.* Pp. 24.

The principal subjects discussed are Land depreciation; Causes of agricultural depression and tendency to leave the farm; Discontent with rural life; Agricultural experiment stations; and Check to city migration.

Seventy-four per cent of the replies received by Mr. Powell, who conducted the inquiry, said that there is a tendency among farmers to leave their farms and live in towns and cities. Among the causes of this tendency 10 per cent assigned it to unprofitable farming, 18 per cent to the greater school facilities in towns, 10 per cent to the difficulty of obtaining good help, 5 per cent to higher wages, and 5 per cent to easier living.

Statistics of the Dairy, Compiled from the United States Census for 1890, and from Other Reliable Sources, with Explanatory Notes. By Henry E. Alvord, Chief of the Dairy Division, United States Department of Agriculture, Bureau of Animal Industry. Bulletin No. 11. Washington, 1896. Pp. 53.

This is the first report devoted to this special subject that has yet appeared in the United States. It includes a discussion of the agricultural statistics of the Eleventh Census by John Hyde, Special Agent of the last census.

Proceedings of the Twenty-Sixth Annual Meeting of the National Board of Trade held in Washington January, 1896. Philadelphia. Pp. 277.

Of special interest to statisticians is the discussion, pages 213–219, on the agricultural statistics published by the United States Department of Agriculture.

The thirteenth edition of the *Directory of the Iron and Steel Works of the United States*, issued March 4th of this year, notes all changes to January 1, 1896. Perhaps the most interesting part is that dealing with the growth of the tin plate industry. At the present time there are 69 completed works, as compared with 20 in 1892.

Report of the Minister of Finance to H. M., Emperor, on the Budget of the Empire for 1896. St. Petersburg, 1895. Pp. 48.

This report contains some most excellent observations on the question of speculation as an economic force. The report that the treas-

urer has been using the sums deposited in the savings banks is expressly denied.

Twenty-Eighth Report of the Commissioners of Her Majesty's Inland Revenue, for the Year Ended 31st March, 1895. London, 1895. Pp. 62, lx.

The new feature in this report is the more detailed discussion of the death duties, caused by the act of 1894. The financial effects of this great change in death duties are indicated in the tables, the statistics being much fuller than any which have previously been published.

The *Annual Report of the United States Secretary of the Treasury* for 1895 contains an interesting chart showing the rate of foreign exchange between New York and London in the first week of each month from 1878 to 1895. In combination with this curve is shown the monthly imports and exports of gold.

Publications of the American Statistical Association.

The New Series of the Association, issued quarterly, will be sent to members of the Association on payment of the annual assessment of two dollars. The subscription price is also two dollars per annum. Separate copies can also be purchased upon remittance of the advertised prices.

VOL. I. 1888–1889. NOS. 1–8. Pp. 492.

As No. 4 is out of print it is impossible to furnish this volume complete. Price, without No. 4, $3.50.

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